3139-Pos Board B569
Food Colors as Intrinsic Luminescent Sensors in Edible Products
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Limited use of luminescence spectroscopy in food and pharmaceutical applications can be related to two main causes: a)the inherent properties of most useful fluorophores (low availability, toxicity, high price and restricted solubility), and b)incomplete photophysical characterization of edible and safe-to-ingest fluorophores.
To expand the use of luminescence spectroscopy to monitor quality and safety of edible goods, photophysical properties of five generally-recognized-as-safe(GRAS) food colors that are routinely added to foods or pharmaceuticals were assessed. The sensitivity of the food dyes' fluorescence emission intensity to the surrounding medium's rigidity and polarity were also determined.
Environmental polarity moderately impacted the location of the fluorescence intensity peaks and bathochromic shifts were observed for all dyes as the polarity of the solvents increased. The Stokes shifts,(λem-λexc), were estimated to be 45-90nm depending on the medium and molecular structure of the synthetic color. All these food dyes were practically non emissive in common fluid solvents, which can explain the limited information on their photophysical properties. Excited state tautomerization and/or internal twisting, already reported in synthetic non-edible dyes in low viscosity solutions, can also constitute the predominant non- radiative relaxation pathway of the studied food colors in fluid environments. The medium's rigidity was altered by changing temperature and composition. As the viscosity and consistency index of the surrounding medium increased, the dyes' fluorescent emission intensity also increased, which suggests the molecular rotor character of these dyes. The maximum fluorescence intensity of each dye vs. viscosity relationship was characterized by a power law model and the sensitivity of each dye to changes in viscosity was evaluated in terms of its parameters.
In principle, the large Stokes shift and sensitivity to viscosity supports the potential use of these food colors as probes of microviscosity or molecular crowding in edible goods.

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Probing the Internal and External Structure of Carbon Nanodots through Fluorescence Quenching
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In past several years, there has been significant investigation into the various synthetic routes of carbon nanodots along with their associated photophysical properties [1-3]. Carbon nanodots are naturally fluorescing nanometer-sized particles with interesting and unique photophysical properties, which make them highly applicable for various applications in the life sciences [2-3]. Our lab has been investigating these particles produced by various combustion routes for many years, studying both the photophysical and plasmon-enhanced photophysical properties [1]. In order to fully understand the photophysical properties of carbon nanodots, in this poster we have examined the both the internal and external structure of these particles in an attempt to ascertain the origins of the fluorescence signature/s, using a combination of differently charged ions; which ultimately results in both static and dynamic quenching processes being observed. Our results reveal significant vibronic structure of the nanodots' chromophore, which can readily be quenched by non-charged ions (acrylamide), suggesting a buried fluorescent chromophore center.
[1] Y. Zhang, H. Gonçalves, J. C. G. Esteves Da Silva, and C. D. Geddes, ''Metal-enhanced photoluminescence from carbon nanodots,'' Chem. Commun. 47, 5313-5315 (2011).
[2] S. Baker and G. Baker, ''Luminescent Carbon Nanodots: Emergent Nanolights,'' Angew, Chem. Int. Ed. 49, 6726-6744 (2010).
[3] H. Li, Z. Kang, Y. Liu, and S-T. Lee, ''Carbon nanodots synthesis, properties and applications,'' J. Mater. Chem, 22, 24230-24253 (2010).

3141-Pos Board B571
Fluorescence Studies of a Long Lifetime Fluorophore, ADOTA in Silica and PVA Thin Films
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The cationic triangulenium dye, azadioxatriangulenium (ADOTA) was entrapped in silica thin films obtained by the sol-gel process and in poly (vinyl) alcohol (PVA) thin films. ADOTA is a red emitting organic fluorophore with a long fluorescence lifetime of ~20 ns. Silica thin films are ideal materials for the entrapment of fluorescent molecules because they hold these molecules in a microporous support matrix. The smaller analyte species can easily diffuse and interact with the fluorophore. For comparison, we also incorporated ADOTA in PVA films, which serve as a model for a more rigid and isotropic matrix for the entrapment of fluorophores. The photophysical properties of ADOTA in silica thin films and PVA films were studied by means of steady–state and time resolved fluorescence techniques. At 560 nm observation, the fluorescence lifetime of the ADOTA in silica matrix is 11.84 ns compared to 19.95 ns in the PVA film. However, when observed at 620 nm, the fluorescence lifetimes of ADOTA entrapped in both the matrices are almost 20 ns. We have found that the ADOTA incorporated in silica thin film has a wider lifetime distribution (Lorentzian distribution) compared to ADOTA in PVA film. The local environment of ADOTA molecules in silica thin film is rich in water and ethanol, which creates the possibility of forming aggregates due to high concentration of dye within a small confined area. In contrast to the PVA matrices, the porous silica films allow restricted rotations of ADOTA molecules, which result in faster and complex fluorescence anisotropy decays. These types of fluorescent hybrid materials are ideal for developing fluorescence based biosensors, highly luminescent materials in medicine, functional materials in optoelectronic devices and optical components like solid state tunable lasers.

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A Comparison of Photophysical Characteristics of rHDL Encapsulated Anti-Cancer Drug Valrubicin and Free Valrubicin
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Drug delivery via nanotechnology is one of the rapidly developing fields in cancer therapeutics. Targeted drug delivery has the advantage of having minimal interaction with healthy tissue, thereby reducing the toxicity of the drug to the rest of the body. rHDL nanoparticles are an efficient method of drug delivery for highly lipophilic anti-cancer drugs. Scavenger receptors class B type I (SR-BI), which are highly expressed on cancer cells interact with rHDL nanoparticles for effective drug delivery to the cancer cell and tumor. Valrubicin is an anti-cancer drug, with intrinsic fluorescence. In this experiment, we compared the photophysical properties of free valrubicin and rHDL valrubicin via steady state and time resolved fluorescence measurements. The steady-state anisotropy of rHDL valrubicin is higher as compared to free valrubicin, suggesting its encapsulation in rHDL nanoparticles. A longer rotational correlation time was observed for rHDL valrubicin in time resolved anisotropy measurements compared to free valrubicin, further supporting steady state anisotropy data.. We also studied the cellular internalization of free valrubicin and rHDL valrubicin using confocal microscopy. This could help track the movement of rHDL nanoparticles within the cancer cells.

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Spectral Distortions in Metal-Enhanced Fluorescence
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In recent years our laboratory and others have demonstrated many examples and concepts in Metal-Enhanced Fluorescence[1] (MEF), a surface plasmon phenomenon, which amplifies both fluorescence and luminescence signatures in the near-field, i.e. less than one wavelength of light away from a metallic object[1]. In all of these examples of MEF, and for over a decade, the fluorescence spectra has simply been reported as being enhanced, i.e. the emission is greater from a plasmonic substrate as compared to a suitable control sample.
However, in this paper we will show that Metal-Enhanced Fluorescence from both a variety of plasmonic substrates and using a range of different fluorophores, often results in fluorophore spectral distortion[2]. More often than not, the red edge of the fluorescence spectra is observed to be distorted, as compared to the emission spectra of a fluorophore observed in the far-field and distal from plasmonic interactions. In addition, a significant MEF effect often results